PROTOCOL EXTENSION
TO
SIMNET 6.6.1

LORAL DEFENSE SYSTEMS-AKRON
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MULTIRAD NETWORK

PROTOCOL EXTENSION
TO
SIMNET 6.6.1

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Rev. N/C	2 April 1992	Update
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PROTOCOL EXTENSION
TO
SIMNET 6.6.1

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1.0 **Introduction**

This paper identifies the protocol extensions to SIMNET 6.6.1 developed by Loral Defense Systems-Akron for Armstrong Labs at Williams AFB. The protocol extensions were designed to support the unique requirements of air to air combat involving heterogeneous simulators .

Five protocol data units (PDU's) were modified by the addition of new data fields:
- Activate Request,
- Deactivate Request
- Vehicle Appearance,
- Fire and
- Impact.

These PDU's and their new fields are described in the body of the text.

Three completely new PDU's were added. They are:
- Radar,
- Emitter and
- Freeze.

The Radar PDU describes describes a radar and lists the vehicles being illuminated. The Emitter PDU describes all emitters that are not radars. The Freeze (Unfreeze) PDU's, control vehicle activation individually or globally. This allows an entire scenario to be controlled/synchronized from a single location.

2.0 **Protocol Data Units**

2.1 **Activate Request PDU**

One network device may prompt another to begin simulating a vehicle through an activate request. The following fields have been added to SIMNET 6.6.1 to provide initial start-up conditions for a vehicle.

- Speed,
- Freeze (Frozen or Unfrozen)
- Fuel quantity
- Radio Channel and
- Mission Number.

The Activate Request PDU includes the following data:

FIELD SIZE (bits)	ACTIVATE REQUEST PDU FIELDS	
8	PROTOCOL VERSION	8-bit unsigned integer
8	PDU TYPE	8-bit unsigned integer
8	EXERCISE ID	8-bit unsigned integer
40	PADDING	40-bit unsigned integer
8	ACTIVATE REASON	8-bit unsigned integer
8	VEHICLE CLASS	8-bit unsigned integer
48	VEHICLE ID	Site - 16-bit unsigned integer
		Host - 16-bit unsigned integer
		Vehicle - 16-bit unsigned integer
160	ORGANIZATIONAL UNIT	Force ID - 8-bit unsigned integer
		Organization Type - 8-bit unsigned integer
		Unit Identifier - 18 - 8-bit unsigned integers
96	MARKING	Character Set - 8-bit integer
		Text - 11 - 8-bit characters
64	VEHICLE GUISES	Distinguished - 32-bit unsigned integer
		Other - 32-bit unsigned integer
32	SIMULATED TIME	32-bit unsigned integer

B

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FIELD SIZE (bits)	ACTIVATE REQUEST PDU CONTINUED		
128	TERRAIN DATABASE ID	Terrain Name - 14 - 8-bit characters	
		Terrain Version - 16-bit unsigned integer	
8	BATTLE SCHEME	8-bit unsigned integer	
1	ON SURFACE	1-bit unsigned integer	
23	PADDING	23-bit integer	
960	VEHICLE STATUS	Vehicle Type - 32-bit unsigned integer	
		Odometer - 32-bit floating point	
		Age - 8-bit unsigned integer	
		Unused - 24-bits	
		Failures (Vehicle Subsystems) - 416-bits	
		Status Category - 16-bit unsigned integer	
		Padding - 16-bit integer	
		Engine Power - 8-bit unsigned integer	
		Battery Voltage - 24-bit unsigned integer	
		Munition Record [6]	Type - 32-bit unsigned integer
			Quantity - 32-bit floating point
192	LOCATION (WORLD COORDINATES)	x - 64-bit floating point	
		y - 64-bit floating point	
		z - 64-bit floating point	
64	SIMPLE VEHICLE DATA (A/C)	Yaw - 32-bit BAM	
		Padding - 32-bit integer	
96	VELOCITY	x - 32-bit floating point	
		y - 32-bit floating point	
		z - 32-bit floating point	
1	FREEZE STATE	1-bit unsigned integer	
31	PADDING	31-bit unsigned integer	
32	VLVIS	32-bit floating point	

Generic Status Category (A/C)   B

B

FIELD SIZE (bits)	ACTIVATE REQUEST PDU CONTINUED	
8	SKY COLOR	8 - bit unsigned integer
24	PADDING	24 - bit integer
32	FUEL QUANTITY	32-bit floating point
16	RADIO CHANNEL	16-bit unsigned integer
16	MISSION #	16-bit unsigned integer
1536	WAYPOINTS [16]	Lat - 32-bit floating point
		Lon - 32-bit floating point
		Alt - 32-bit floating point

Total Activate Request PDU Size = 3648 bits

Simulation PDU header information
    PROTOCOL VERSION   SIMNET protocol version used in the variant portion of the
                              PDU
    PDU TYPE   PDU type to follow in the variant portion of the packet
    EXERCISE ID   Exercise generating PDU (important when multiple
                              exercises on network)

Activate Request Variant
    ACTIVATE REASON   Reason to activate the vehicle
        0   Activate reason other
        1   Exercise start
        2   Exercise restart
        3   Vehicle reconstitution
        4   Towing arrival
    VEHICLE CLASS   Class for number of independently moveable parts for
                              RVA
        0   Vehicle class irrelevant
        1   Vehicle class static
        2   Vehicle class simple
        3   Vehicle class tank
    VEHICLE ID   Vehicle identification
        Simulation address   Site
                                  Host
        Vehicle
    ORGANIZATIONAL UNIT   Organizational hierarchy (not currently used)
    MARKING   Character string of vehicle markings

VEHICLE GUISES
        Distinguished   As seen by blue team
        Other   As seen by other teams
        Bit field

Domain	3
Environment	3
Class	3
Class	3
Country	6
Series	6
Model	6
Function	5

SIMULATED TIME   Time being simulated
TERRAIN DATABASE ID   Database being used
BATTLE SCHEME   Identifies how force ID's and guises are being used
     0   Battle scheme other
     1   Battle scheme absolute (does not use guises)
     2   Battle scheme relative (uses guises)
ON SURFACE   Indicates if vehicle is on the surface of the database or in flight
VEHICLE STATUS   Contains status of vehicle. The only field currently used is munitions.
LOCATION   Location in world coordinates (meters)
VEHICLE DATA - YAW   Initial rotation of vehicle (BAM)
VELOCITY   Initial velocity (meters per second) | B
FREEZE STATE   Initial freeze mode
     0   Unfreeze
     1   Freeze
VLSVIS   Visibility in visible light (meters) | B
SKY COLOR   Simulated sky color | B
FUEL QUANTITY   Initial fuel (pounds)
RADIO CHANNEL   Radio channel
MISSION NUMBER   Number of mission for initialization
WAYPOINTS   Lat, lon and alt of 16 waypoints

2.2 Activate Response PDU

A network device that correctly receives an Activate Request must immediately respond by returning an Activate Response. No changes were made to this PDU from the SIMNET 6.6.1 baseline. The Activate Response includes the following data:

FIELD SIZE (bits)	ACTIVATE RESPONSE PDU FIELDS	
8	PROTOCOL VERSION	8-bit unsigned integer
8	PDU TYPE	8-bit unsigned integer
8	EXERCISE ID	8-bit unsigned integer
40	PADDING	40-bit unsigned integer
48	VEHICLE ID	Site - 16-bit unsigned integer
		Host - 16-bit unsigned integer
		Vehicle - 16-bit unsigned integer
8	RESULT	8-bit unsigned integer
8	PADDING	8-bit unsigned integer
16	TIME LIMIT	16-bit unsigned integer
16	PADDING	16-bit integer
32	PADDING	32-bit integer

B

Total Activate Response PDU Size = 192 bits

B

Simulation PDU header information
    PROTOCOL VERSION   SIMNET protocol version used in the variant portion of the PDU
    PDU TYPE   PDU type to follow in the variant portion of the packet
    EXERCISE ID   Exercise generating PDU (important when multiple exercises on network)

Activate response variant
    VEHICLE ID   Vehicle identification
        Simulation address   Site
                    Host
        Vehicle

REASON
   0   Activate request accepted
   1   Invalid activation parameter
   2   Unexpected activate reason
   3   Invalid vehicle identifier
   4   Terrain database unavailable
TIME LIMIT   Not currently used

2.3 Deactivate Request PDU

A network device may withdraw its own vehicles from an exercise at any time, or it may be requested by another simulator to withdraw. In either case, the withdrawal of the vehicle is announced using a Deactivation. The time stamp field was added to this PDU.

FIELD SIZE (bits)	DEACTIVATE REQUEST PDU FIELDS	
8	PROTOCOL VERSION	8-bit unsigned integer
8	PDU TYPE	8-bit unsigned integer
8	EXERCISE ID	8-bit unsigned integer
40	PADDING	40-bit unsigned integer
48	VEHICLE ID	Site - 16-bit unsigned integer
		Host - 16-bit unsigned integer
		Vehicle - 16-bit unsigned integer
8	REASON	8-bit unsigned integer
8	PADDING	8-bit unsigned integer
32	TIME STAMP	32-bit unsigned integer

B

Total Deactivate Request PDU Size = 160 bits

B

Simulation PDU header information
   PROTOCOL VERSION   SIMNET protocol version used in the variant portion of the PDU
   PDU TYPE   PDU type to follow in the variant portion of the packet
   EXERCISE ID   Exercise generating PDU (important when multiple exercises on network)

Deactivate request variant

VEHICLE ID   Vehicle identification
        Simulation address   Site
                                  Host
        Vehicle
REASON   Reason for deactivation
        0   Deactivate reason other
        1   Exercise end
        2   Vehicle withdrawn
        3   Vehicle destroyed
        4   Towing departure
TIME STAMP   Time of PDU issuance

2.4 Vehicle Appearance PDU

A simulator/network device periodically reports information about a vehicle it simulates so that other devices on the network may depict that vehicle. A network device will issue a new Vehicle Appearance for a vehicle whenever the discrepancy between the vehicle's actual appearance and its dead reckoned appearance exceeds one of the defined thresholds. It will also issue a new Vehicle Appearance if 5 seconds have elapsed since its last transmittal. This PDU has been modified to include a linear acceleration vector, an angular acceleration vector, throttle position and fuel quantity. A Vehicle Appearance PDU includes the following data:

FIELD SIZE (bits)	VEHICLE APPEARANCE PDU FIELDS	
8	PROTOCOL VERSION	8-bit unsigned integer
8	PDU TYPE	8-bit unsigned integer
8	EXERCISE ID	8-bit unsigned integer
40	PADDING	40-bit unsigned integer
48	VEHICLE ID	Site - 16-bit unsigned integer
		Host - 16-bit unsigned integer
		Vehicle - 16-bit unsigned integer
8	VEHICLE CLASS	8-bit unsigned integer
8	FORCE ID	8-bit unsigned integer
64	VEHICLE GUISES	Distinguished - 32-bit unsigned integer
		Other - 32-bit unsigned integer

B

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FIELD SIZE (bits)	VEHICLE APPEARANCE PDU CONTINUED	
192	LOCATION (WORLD COORDINATES)	x - 64-bit floating point
		y - 64-bit floating point
		z - 64-bit floating point
288	ROTATION MATRIX	9 - 32-bit floating points
32	APPEARANCE	32-bit unsigned integer
96	MARKING	Character Set - 8-bit integer
		Text - 11 - 8-bit characters
32	TIME STAMP	32-bit unsigned integer
32	CAPABILITIES	32-bit unsigned integer
16	ENGINE SPEED	16-bit unsigned integer
1	STATIONARY	1-bit unsigned integer
7	PADDING	7-bit integer
8	REASON	8-bit unsigned integer
96	LINEAR VELOCITY VECTOR	x - 32-bit floating point
		y - 32-bit floating point
		z - 32-bit floating point
32	PADDING	32-bit unsigned integer
96	LINEAR ACCEL. VECTOR	x - 32-bit floating point
		y - 32-bit floating point
		z - 32-bit floating point
96	ANGULAR VELOCITY VECTOR	pitch rate - 32-bit floating point
		roll rate - 32-bit floating point
		yaw rate - 32-bit floating point
32	THROTTLE POSITION	32-bit floating point
32	FUEL QUANTITY	32-bit floating point

B

Vehicle Class Simple

Total Vehicle Appearance PDU Size = 1280 bits

B

Simulation PDU header information
    PROTOCOL VERSION   SIMNET protocol version used in the variant portion of the
                               PDU
    PDU TYPE   PDU type to follow in the variant portion of the packet
    EXERCISE ID   Exercise generating PDU (important when multiple
                               exercises on network)

Vehicle Appearance variant
    VEHICLE ID   Vehicle identification
            Simulation address   Site
                                      Host
            Vehicle
    VEHICLE CLASS   Class for number of independently moveable parts for
                               RVA
        0   Vehicle class irrelevant
        1   Vehicle class static
        2   Vehicle class simple
        3   Vehicle class tank
    FORCE ID   Force identifier
        0   Force ID irrelevant
        1   Distinguished force ID
        2   Other force ID
        3   Observer force ID
        4   Target force ID
    VEHICLE GUISES
            Distinguished   As seen by blue team
            Other   As seen by other teams
            Bit field
                Domain   3
                Environment   3
                Class   3
                Country   6
                Series   6
                Model   6
                Function   5
    LOCATION   Location in world coordinates (meters)
    ROTATION MATRIX   3x3 rotation matrix for vehicle orientation
    APPEARANCE   Bit field
        BIT   PURPOSE
        0   Vehicle destroyed (1=true)
        1   Vehicle smoke plume (1=true)
        2   Vehicle flaming (1=true)
        3-4   Vehicle dust cloud
                    0   No dust cloud
                  · 1   Small dust cloud
                    2   Medium dust cloud
                    3   Large dust cloud

B

5	Vehicle mobility disabled (1=true)	
6	Vehicle fire power disabled	B
7	Vehicle communications disabled	
8	Vehicle shaded (1=vehicle in shadow)	
30	Vehicle TOW launcher up	
31	Vehicle engine smoke	

MARKING	Character string of vehicle markings	
TIMESTAMP	Time PDU was issued	
CAPABILITIES	Capabilities of the vehicle (bit field)	B
ENGINE SPEED	Engine speed (Revolutions per second)	
STATIONARY	Flag variable	
REASON	Reason for issuing PDU	B
LINEAR VELOCITY VECTOR	Velocity vector in world coordinates (m/s)	
LINEAR ACCELERATION	Acceleration vector (m/s2)	
ANGULAR VELOCITY	Angular velocity vector (rad/s)	
THROTTLE POSITION	Engine throttle position	
FUEL QUANTITY	Pounds of fuel remaining	

2.5 Fire PDU

A Fire describes the firing of a shell, a burst of machine gun fire, or a missile. It is issued by the firing vehicle simulator. A time stamp has been added to this PDU.

FIELD SIZE (bits)	FIRE PDU FIELDS	
8	PROTOCOL VERSION	8-bit unsigned integer
8	PDU TYPE	8-bit unsigned integer
8	EXERCISE ID	8-bit unsigned integer
40	PADDING	40-bit unsigned integer
48	ATTACKER ID	Site - 16-bit unsigned integer
		Host - 16-bit unsigned integer
		Vehicle - 16-bit unsigned integer
16	EVENT ID	16-bit unsigned integer

B

FIELD SIZE (bits)	FIRE PDU CONTINUED		
96	BURST DESCRIPTOR	Projectile - 32-bit unsigned integer	
		Detonator - 32-bit unsigned integer	
		Quantity - 16-bit unsigned integer	
		Rate - 16-bit unsigned integer	
64	TARGET DESCRIPTOR	Target Type - 8-bit integer	
		Unused - 8-bit integer	
		Site - 16-bit unsigned integer	
		Host - 16-bit unsigned integer	
		Vehicle - 16-bit unsigned integer	
96	VELOCITY VECTOR	x - 32-bit floating point	
		y - 32-bit floating point	
		z - 32-bit floating point	
192	LOCATION (WORLD COORDINATES)	x - 64-bit floating point	
		y - 64-bit floating point	
		z - 64-bit floating point	
48	PROJECTILE ID	Site - 16-bit unsigned integer	
		Host - 16-bit unsigned integer	
		Vehicle - 16-bit unsigned integer	
8	PADDING	8-bit unsigned integer	
8	FIRE TYPE	8-bit unsigned integer	
128	SHELL FIRE DESCRIPTOR	Range - 32-bit floating point	FIRE TYPE = shell
		Slew Rate - 32-bit floating point	
		Ammo Type - 32-bit unsigned integer	
		Padding - 32-bit integer	
	MISSILE FIRE DESCRIPTOR	Tube - 8-bit unsigned integer	FIRE TYPE = missile
		Padding - 8-bit unsigned integer	
		Padding - 16-bit integer	
		Padding - 32-bit integer	
		Padding - 32-bit integer	
		Padding - 32-bit integer	

FIELD SIZE (bits)	FIRE PDU CONTINUED	
32	TIME STAMP	32-bit unsigned integer

Total Fire PDU Size = 800 bits

B

Simulation PDU header information
>PROTOCOL VERSION — SIMNET protocol version used in the variant portion of the PDU
>PDU TYPE — PDU type to follow in the variant portion of the packet
>EXERCISE ID — Exercise generating PDU (important when multiple exercises on network)

Fire variant
>ATTACKER ID — Vehicle identification
>>Simulation address — Site
>>Host
>>Vehicle
>EVENT ID — For correlation with impact PDU
>BURST DESCRIPTOR
>>Projectile — Munition
>>Detonator — Detonator
>>Quantity — # of projectiles
>>Rate — Burst rate
>TARGET DESCRIPTOR
>>Target type
>>>0 — Target unknown
>>>1 — Target not a vehicle
>>>2 — Target is a vehicle
>>Vehicle ID
>VELOCITY VECTOR — Velocity of the projectile
>LOCATION — World coordinates of origination of projectile
>PROJECTILE ID — Vehicle ID of projectile
>>Simulation address — Site
>>Host
>>Vehicle
>FIRE TYPE — Type of projectile
>>1 — Fire type shell
>>2 — Fire type missile
>If FIRE TYPE = shell
>>RANGE — Range of munition
>>SLEW RATE — rate
>>AMMO TYPE — Type of ammunition

If FIRE TYPE = missile
       TUBE   Tube from which missile was launched
    TIME STAMP   Time when PDU was issued

2.6 Impact PDU

An Impact is issued by a simulator when the flight of a projectile it is simulating ends. It may or may not describe an impact between the projectile and a particular target vehicle. A time stamp and probability of kill field have been added. Probability of kill is expressed as a number between zero and one.

FIELD SIZE (bits)	IMPACT PDU FIELDS	
8	PROTOCOL VERSION	8-bit unsigned integer
8	PDU TYPE	8-bit unsigned integer
8	EXERCISE ID	8-bit unsigned integer
40	PADDING	40-bit unsigned integer
48	ATTACKER ID	Site - 16-bit unsigned integer
		Host - 16-bit unsigned integer
		Vehicle - 16-bit unsigned integer
16	EVENT ID	16-bit unsigned integer
96	BURST DESCRIPTOR	Projectile - 32-bit unsigned integer
		Detonator - 32-bit unsigned integer
		Quantity - 16-bit unsigned integer
		Rate - 16-bit unsigned integer
48	PROJECTILE ID	Site - 16-bit unsigned integer
		Host - 16-bit unsigned integer
		Vehicle - 16-bit unsigned integer
8	FIRE RESULT	8-bit unsigned integer
8	PADDING	8-bit unsigned integer
32	MOMENTUM	32-bit floating point
32	ENERGY	32-bit floating point

FIELD SIZE (bits)	IMPACT PDU CONTINUED	
32	DIRECTIONALITY	32-bit floating point
192	LOCATION (WORLD COORDINATES)	x - 64-bit floating point
		y - 64-bit floating point
		z - 64-bit floating point
64	RANGE	64-bit floating point
48	TARGET ID	Site - 16-bit unsigned integer
		Host - 16-bit unsigned integer
		Vehicle - 16-bit unsigned integer
16	VEHICLE COMPONENT	16-bit unsigned integer
96	IMPACT LOCATION (VEHICLE COORDINATES)	x - 32-bit floating point
		y - 32-bit floating point
		z - 32-bit floating point
96	TRAJECTORY (VEHICLE COORDINATES)	x - 32-bit floating point
		y - 32-bit floating point
		z - 32-bit floating point
32	TIME STAMP	32-bit unsigned integer
16	PK	16-bit integer

Total Impact PDU Size = 928 bits

B

Simulation PDU header information

PROTOCOL VERSION	SIMNET protocol version used in the variant portion of the PDU
PDU TYPE	PDU type to follow in the variant portion of the packet
EXERCISE ID	Exercise generating PDU (important when multiple exercises on network)

Impact variant

ATTACKER ID	Vehicle identification
Simulation address	Site
	Host
Vehicle	
EVENT ID	For correlation with fire PDU
BURST DESCRIPTOR	

                    Projectile   Munition
                    Detonator   Detonator
                    Quantity   # of projectiles
                    Rate   Burst rate
     PROJECTILE ID   Vehicle ID of projectile
                    Simulation address   Site
                                            Host

                    Vehicle
     FIRE RESULT
                    14   Hit / Terminate / Kill
                    15   No target miss
                    16   Velocity gate miss
                    17   Gimbal limit miss
                    18   Ground impact miss
                    19   Low closure rate miss
                    20   Low velocity miss
                    21   Max time of flight miss
                    22   Safe-arm miss
                    23   Low probability of kill miss
                    24   Excessive miss distance
                    25   Target already killed
                    26   Line of sight miss (AIM-9)
                    27   Jettisoned
                    28   Terminated but not yet scored
     MOMENTUM   Momentum of projectile
     ENERGY   Energy of projectile at impact
     DIRECTIONALITY   Directionality of projectiles explosion in steradians
     LOCATION   Location of impact in world coordinates (meters)
     RANGE   Range of projectile
     TARGET ID   Vehicle ID of target
                    Simulation address   Site
                                            Host

                    Vehicle
     VEHICLE COMPONENT   Component struck by projectile
                    0   Vehicle component irrelevant
                    1   Hull component
                    2   Turret component
     IMPACT LOCATION   Location of impact in vehicle coordinates
     TRAJECTORY   Vehicle coordinates
     TIME STAMP   Time when PDU was issued
     PK   Probability of kill

2.7 Radar PDU

A Radar periodically issued by the simulator of a vehicle possessing a radar. This entire PDU is new and was added to meet Armstrong Labs unique requirements. The PDU's describe the location, and characteristics of the signals with the following data:

FIELD SIZE (bits)	RADAR PDU FIELDS	
8	PROTOCOL VERSION	8-bit unsigned integer
8	PDU TYPE	8-bit unsigned integer
8	EXERCISE ID	8-bit unsigned integer
40	PADDING	40-bit unsigned integer
48	VEHICLE ID	Site - 16-bit unsigned integer
		Host - 16-bit unsigned integer
		Vehicle - 16-bit unsigned integer
32	TIME STAMP	32-bit unsigned integer
8	# ILLUMED	8-bit unsigned integer
8	PADDING	8-bit unsigned integer
32	RADAR SYSTEM	32-bit integer
8	RADAR MODE	8-bit unsigned integer
8	PADDING	8-bit unsigned integer
128	SWEEP	Azimuth Center - 32-bit floating point
		Azimuth Width - 32-bit floating point
		Elevation Center - 32-bit floating point
		Elevation Width - 32-bit floating point
32	POWER	32-bit integer

B

FIELD SIZE (bits)	RADAR PDU CONTINUED		
80 n	VEHICLE ID	Site - 16-bit unsigned integer	For Each Illumined Entity
		Host - 16-bit unsigned integer	
		Vehicle - 16-bit unsigned integer	
	RADAR DATA	32-bit integer	

Total Radar PDU Size = 368 + 80n bits | B

Simulation PDU header information
      PROTOCOL VERSION   SIMNET protocol version used in the variant portion of the
                                PDU
      PDU TYPE   PDU type to follow in the variant portion of the packet
      EXERCISE ID   Exercise generating PDU (important when multiple
                                exercises on network)

Radar variant
      VEHICLE ID   Vehicle identification
                  Simulation address   Site
                                            Host
            Vehicle
      TIME STAMP   Time when PDU was issued
      # ILLUMED   Number of vehicles illuminated by radar
      RADAR SYSTEM   Bit field identifying radar system
            Radar System Category (Bits 28-31)
                  0   Reserved (unused)
                  1   Air-Based Fire Control
                  2   Air-Based Search
                  3   Ground-Based Fire Control
                  4   Ground-Based Search
                  5   Sea-Based Fire Control
                  6   Sea-Based Search
            RadarSystem Subcategory(Bits 16-23 optional)
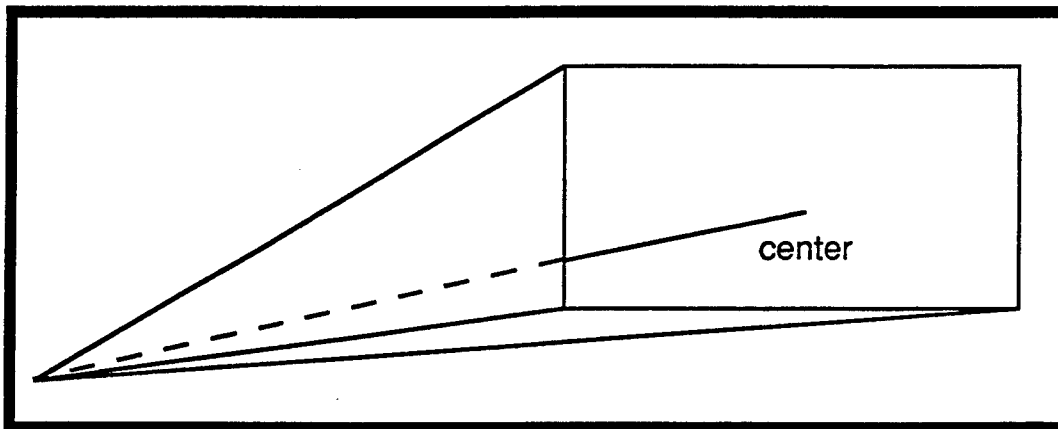   RadarSystem ID (Bits 0-15)
                  0   Reserved   14   HighLark
                  1   APG-66   15   AN/APS-125
                  2   APG-68   16   LN-66 HP
                  3   APG-63   17   AN/APS-166
                  4   APG-65   18   AN/APS-115
                  5   APG-70   19   AN/SPQ-9
                  6   JAYBIRB   20   AN/SPQ-9A
                  7   (Mig-31)   21   AN/SPG-60
                  8   (Mig-29)   22   AN/SPS-49
                  9   (Mig-27)   23   AN/SPS-55

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10	(Su-27)	24	AN/SPS-67
11	AN/APY-2	25	AN/SPS-10
12	SUAWACS	26	SPY-1a
13	FoxFire		

RADAR MODE   Current radar mode
    1   Search
    2   Doppler HPRF
    3   Doppler MPRF
    4   Doppler LPRF
    5   Monopulse
    6   Acquisition
    7   Tracking
    8   Track while scan
    9   Terrain follow
    10   Data link

AZIMUTH CENTER   Azimuth center angle
AZIMUTH WIDTH   Azimuth width half angle
ELEVATION CENTER   Elevation center angle
ELEVATION WIDTH   Elevation width half angle

RADAR CONE

RADAR POWER   Average emitting power in decibel milliwatts
RADAR TARGET LIST
    Vehicle ID
    Radar data
        bits   24 - 31   -> Radar Mode pertaining to applicable Vehicle ID
        bits   0 - 23   -> Specific Radar System/Radar Mode data (optional)
                    Might be : Polarization, Freq Hopping, Staggered
                    PRF, etc]

2.8 Emitter PDU

A new PDU periodically issued by a simulator for emitters other than radars. The PDU's describe the location, and characteristics of the signals with the following data:

FIELD SIZE (bits)	EMITTER PDU FIELDS	
8	PROTOCOL VERSION	8-bit unsigned integer
8	PDU TYPE	8-bit unsigned integer
8	EXERCISE ID	8-bit unsigned integer
40	PADDING	40-bit unsigned integer
48	VEHICLE ID	Site - 16-bit unsigned integer
		Host - 16-bit unsigned integer
		Vehicle - 16-bit unsigned integer
32	TIME STAMP	32-bit unsigned integer
16	# EMITTERS	16-bit integer
256 n	EMITTER CLASS	16-bit unsigned integer
	DATABASE #	16-bit unsigned integer
	EMITTER MODE	16-bit unsigned integer
	EMITTER POWER	16-bit unsigned integer
	FREQUENCY	32-bit floating point
	CHANNEL	32-bit unsigned integer
	SWEEP	Azimuth Center - 32-bit floating point
		Azimuth Width - 32-bit floating point
		Elevation Center - 32-bit floating point
		Elevation Width - 32-bit floating point

B

For Each Emitter

Total Emitter PDU Size = 160 + 256n bits

B

Simulation PDU header information
    PROTOCOL VERSION   SIMNET protocol version used in the variant portion of the PDU
    PDU TYPE   PDU type to follow in the variant portion of the packet
    EXERCISE ID   Exercise generating PDU (important when multiple exercises on network)

Emitter variant
    VEHICLE ID   Vehicle identification
        Simulation address   Site
                               Host
        Vehicle
    TIME STAMP   Time when PDU was issued
    # EMITTERS   Number of emitters on vehicle

For each emitter
    EMITTER CLASS

0	Other	9	SHF
1	Sound	10	EHF
2	infrasonic2 I	11	Infrared
3	VHF	12	Visible
4	LF	13	Ultraviolet
5	MF	14	XRay
6	HF	15	GammaRay
7	VHF	16	CosmicRay
8	UHF		

    DATABASE NUMBER

VHF	0x0001	ILS	0x0020	Jammer	0x1000
UHF	0x0002	AAI	0x0100		
TACAN	0x0010	IFF	0x0200		

    EMITTER MODE

0	Transmit
1	Mode 1
2	Mode 2
3	Mode 3
4	Mode 4
5	Mode 4a
6	Mode 4b

    EMITTER POWER   Average power of emission
    FREQUENCY   Frequency of emission
    CHANNEL   Emitter channel
    AZIMUTH CENTER   Azimuth center angle
    AZIMUTH WIDTH   Azimuth width half angle
    ELEVATION CENTER   Elevation center angle
    ELEVATION WIDTH   Elevation width half angle

2.9 Freeze PDU

The freeze PDU is used to both freeze and unfreeze. It can be used both globally and individually to control an entire exercise. Freeze is particularly useful for starting or restarting an exercise from a precise point in time/space.

FIELD SIZE (bits)	FREEZE PDU FIELDS	
8	PROTOCOL VERSION	8-bit unsigned integer
8	PDU TYPE	8-bit unsigned integer
8	EXERCISE ID	8-bit unsigned integer
40	PADDING	40-bit unsigned integer
8	FREEZE MODE	8-bit unsigned integer
8	PADDING	8-bit unsigned integer
32	TIME STAMP	32-bit unsigned integer
16	# VEHICLES	16-bit unsigned integer
48 n	VEHICLE ID	Site - 16-bit unsigned integer Host - 16-bit unsigned integer Vehicle - 16-bit unsigned integer

For each Selected Vehicle

B

Total Freeze PDU Size = 128 + 48n bits

B

Simulation PDU header information

PROTOCOL VERSION   SIMNET protocol version used in the variant portion of the PDU

PDU TYPE   PDU type to follow in the variant portion of the packet

EXERCISE ID   Exercise generating PDU (important when multiple exercises on network)

Freeze variant

FREEZE MODE
       0   Unfreeze
       1   Freeze

TIME STAMP   Time PDU was issued

VEHICLE   Number of vehicles to change freeze state (Note: use 0 for global)

VEHICLE ID ARRAY   Optional array of vehicle ID's if selectively changing freeze state

       Simulation address   Site

                                Host

       Vehicle

LORAL
DEFENSE SYSTEMS - AKRON

APPENDIX A

Guise Definitions

*** AIRCRAFT ***

A-10:	0x24820802
F-14A:	0x24820821
F-14D:	0x24820841
F-15C:	0x24823042
F-15E:	0x24823021
F-16A:	0x24821021
F-16B:	0x24821041
F-16C:	0x24821061
F-16D:	0x24821081
F-20:	0x24821801
F-4S:	0x24822021
F-5F:	0x24822821
SU-25:	0x24840802
SU-27:	0x24842002
Mig-21:	0x24841021
Mig-23:	0x24841001
Mig-25:	0x24842801
Mig-27:	0x24841801
Mig-29:	0x24842821
Mig-31:	0x24841821

*** CHAFF ***

Chaff:	0x4100400

*** FLARES ***

MJU-7:	0x8100407
MJU-10:	0x810040a

*** SAMS ***

SA-01:	0x48580881
SA-02:	0x48580882
SA-03:	0x48580883
SA-04:	0x48580884
SA-05:	0x48580885

LORAL
DEFENSE SYSTEMS - AKRON

APPENDIX A

Guise Definitions

*** SAMS Continued ***

SA-06:	0x48580886
SA-07:	0x48580887
SA-08:	0x48580888
SA-09:	0x48580889
SA-10:	0x4858088a
SA-11:	0x4858088b
SA-12:	0x4858088c
SA-13:	0x4858088d
SA-14:	0x4858088e
SA-15:	0x4858088f

*** AAA ***

ZSU23_4M:	0x28842821

*** MISSILES ***

Sidewinder:	0x44140420
Tomahawk:	0x448b0420
Patriot:	0x443b0420
AIM_9L:	0x44140421
AIM_9M:	0x44140422
AIM_9P:	0x44140423
AIM_9J:	0x44140424
AIM_9D:	0x44140425
AIM_9G:	0x44140426
AIM_9H:	0x44140427
AIM_7M:	0x44140480
AIM_7L:	0x44140481
AIM_7F:	0x44140482
AIM_7E:	0x44140483

*** BOMBS ***

Mk82:	0x4c510420
GBU-10/12:	0x4c510441